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FEB 2 2 2005
PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No. : 10/680328 Confirmation No. 5445
Applicant : Simon E. Shearman et al
Filed : October 6, 2003
TC/A.U. : 2839
Examiner : Javaid H. Nasri

Docket No. : 71493-1310
Customer No. : 07380

Commissioner for Patents
Alexandria, VA 22313-1450
U.S.A.

Dear Sir:

In response to the Office action of August 4, 2004, please amend this application as follows:

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Claims are reflected in the listing of claims which begins on page 10 of this paper.

Amendments to the Drawings begin on page 14 of this paper and include a written description of the drawing changes.

Remarks/Arguments begin on page 16 of this paper.

An **Appendix** including replacement drawing figures and the new declaration is attached following page 21 of this paper.

Amendments to the Specification:

Please replace the paragraphs starting at page 1, line 16 through to the paragraph ending at page 2, line 27 with the following paragraphs:

SUMMARY

In one aspect the invention features an ~~optics~~ carrier pack including a housing unit having multiple slots configured to accept optical modules, a stack interconnect having a connector associated with a slot of the multiple slots of the housing unit, and an ~~optics~~ carrier pack connector electrically coupled to the connector of the stack interconnect.

Embodiments may include one or more of the following. The carrier pack includes a main circuit board to supply an electrical path to couple the ~~optics~~ carrier pack connector to the connector of the stack interconnect. ~~The pack has a circuit board to supply an electrical path to couple the optics pack connector to the connector of the stack interconnect.~~ The main circuit board is configured to convert a first signaling rate associated with an optical module that is inserted into ~~the~~ a slot to a second signaling rate associated with a device coupled to the ~~optics~~ carrier pack connector. The optical modules share a common set of circuitry ~~in the circuit module~~ on the main circuit board. In another example, the carrier pack includes status indicators associated with operation of the module or a slot. The faceplate may include the status indicators. The stack interconnect is connected to the main circuit board. The stack interconnect includes a repeater to relay a signal or a connection to the circuit module. The carrier pack includes two faceplates separated from each other by a slot in the housing, a light pipe, and/ or a heat sink. The heat sink may be included in an upper part of the housing.

In another embodiment, the stack interconnect can include a riser board and a mezzanine connector. The stack interconnect can include a riser board and a mezzanine connector to electrically couple the connector and the main circuit board. The mezzanine connector can include a male portion and a female portion. The male portion of the mezzanine connector attaches to the main circuit board and the female portion of the mezzanine connector attaches to the riser board. In another example, a female portion of the mezzanine connector attaches to the main circuit board and a male portion of the mezzanine connector attaches to the riser board. The riser board can be removably coupled to a main circuit board.

The carrier pack may also include a second riser board and a second mezzanine connector. In this example, the first mezzanine connector attaches a first riser board to a top side of the main circuit board and the second mezzanine connector attaches a second riser board to a bottom side of the main circuit board. The mezzanine connectors can include a plastic body and metal contacts.

One or more aspects of the invention may provide one or more of the following advantages.

The ~~optical module~~ carrier pack includes a stack interconnect arrangement that splits a single row of slots in the receiving device into an array of slots in the carrier pack. Each slot is configured to accept an optical module, thus, increasing choices available for mixing different types of modules while still fitting into the space allowed for a single slot.

The carrier pack includes a stack interconnect arrangement with mezzanine connectors and riser boards. The arrangement permits removal of a single riser board in the event of a board failure without necessitating the replacement of a main circuit board. Whereas, if circuitry on the main circuit board fails, the main circuit board can be replaced with a new circuit board and the riser boards can be removed from the failed main circuit board and attached to the new main circuit board. [[T]]

Please replace the remaining paragraphs of the specification starting at page 3, line 6 with the following paragraphs:

DESCRIPTION OF DRAWINGS

FIG. 1 is a perspective view of ~~an optics pack~~ a carrier pack adapted to be plugged into a shelf and optical modules adapted to be plugged into the carrier pack provided by an embodiment of the invention.

FIG. 2 is a side view, drawn to an enlarged scale, of ~~the optics pack~~ an optics module shown in ~~of~~ FIG. 1.

FIG. 3 is a top view of ~~the optics pack~~ the optics module shown in ~~of~~ FIG. ~~1~~ 2.

FIG. 4 is a breakaway perspective view, drawn to a slightly enlarged scale, of ~~a bottom tray portion of the optics~~ the carrier pack of Figure 1 ~~holding a circuit board~~.

FIG. 5 shows an interconnect arrangement.

FIG. 6 shows an alternate interconnect arrangement.

FIG. 7 is an alternate embodiment of ~~the~~ a ~~optics~~ carrier pack.

FIG. 8 shows ~~the~~ a circuit board inside the ~~optics~~ carrier pack shown in FIG 7.

DETAILED DESCRIPTION

Referring to FIGS. 1-3, a system 10 includes a carrier pack 14 having slots 30 to accept optical modules 12. The carrier pack 14 connects to an optical back plane ~~16~~ 11 of a switch shelf 16. Multiple ones of the optical modules 12 may be connected to the carrier pack 14. Signals from the multiple optical modules 12 are transmitted through the carrier pack 14, as discussed below, and outputted from the carrier pack 14 on an ~~output~~ connector 26 (FIG. ~~2 and 3~~ 1 and 4) of the carrier pack 14. The ~~output~~ signals from the carrier pack 14 are received ~~on~~ at the optical back plane 11 corresponding to a single I/O slot 28 ~~on~~ of the shelf 16 ~~at the optical back plane 16~~. Similarly, signals from the I/O slot 28 are received by carrier pack 14 and transmitted to optical module 12. Carrier pack 14 includes a housing ~~17~~ including a split faceplate 20 having slots 30 recessed from faceplate 20 to allow the optical modules 12 to be plugged into carrier pack 14. The slots 30 have ~~connectors~~ connector access holes 32 to ~~mate with~~ receive a connector 18 on optical module 12 and provide a connection between carrier pack 14 and optical module 12. Multiple slots 30 are included to form columns 33 of optical modules 12. The slots 30 and ~~mating features~~ connector access holes 32 are configured to allow a variety of optical modules 12 to be plugged into the carrier pack 14. The slots may also include guide rails 29 to assist a user in plugging a module 12 into the carrier pack 14. A feature 31 such as a strip on the side of the optical module 12 fits into the guide rails 29 aligning the connector 18 on the optical module ~~18~~ 12 with the connector access holes 32 in slot 30.

The housing of carrier pack 14 includes a heat sink region 22, endcaps 36, faceplate 20, and topside panels 38. A set of screws 40 connect the faceplate 20, topside panel 38, heat sinking region 22, and endcaps 36. Alternately, adhesive bonding or other fastening techniques can be used to connect the components forming the carrier pack. The housing may be composed of plastic, metal, or a combination of materials.

The carrier pack houses a circuit board 68 (~~not shown~~ Figure 4). During operation the circuit board generates heat, thus, a heat sink region 22 is provided on the carrier pack 14. In this example, heat sink region 22 includes fins. Airflow across the fins cools the fins and dissipates heat from the heat sink region.

Split ~~Faceplate~~ faceplate 20 includes a light emitting diode (LED) 34 functioning as a status indicator. Color-coding of LED 34 allows an operator to de-bug the functionality of the module. For example, a coding system may be used which associates a red LED with a failure, a yellow LED with an error in which the device is still at least partially functional, and a green LED with normal operation. This color-coding system enables an operator to diagnose the functionality of the system 10. The carrier pack may include multiple sets of status indicating LEDs. For example, a carrier pack may include three sets of LEDs: a first set of LEDs reflecting the functionality of the I/O slot 28 in the optical back plane 16, a second set of LEDs reflecting the status of the carrier pack 14, and a third set of LEDs indicating the status of a pluggable optic device 151 (Figure 3 and 7) such as [[an SPF]] a small form pluggable (SFP), or ~~and~~ an ~~XPF~~ 10 Gigabit small form pluggable (XFP) if there are more than one pluggable device on the optical module. Thus, when an operator desires to debug the system, the operator can determine if a failure is associated with I/O slot 28, carrier pack 14, or pluggable optic device 151. In another example, the status indicators may include an LCD panel. The LCD panel displays information on the status of the module, pack, and/or slot.

Referring to FIG. 4, carrier pack 14 includes a circuit board 68 disposed in the carrier pack ~~10~~ 14 under the heat sink region 22. The heat sink region 22 lies above the circuit board for heat dissipation. The circuit board 68 attaches to heat sink region 22. End caps 36 attach to circuit board 68 and heat sink region 22. The end caps 36 may include a feature such as a strip to align the carrier pack 14 to I/O slot 28 in ~~back plane~~ shelf 16. The ~~connector slots~~ connector access holes 32 of the housing match with a connector device 76 on circuit board 68. The connector device 76 provides a path for a signal to travel from the optical module 12 to the circuit board 68.

Circuit board 68 includes routing, power, and circuitry to accept signals from the optical modules 12 and to route signals to optical module 12. The optical modules may operate at different signaling rates from each other or at a different signaling rate from the I/O slot 28 into which the carrier pack 14 is plugged. Thus, the ~~circuit module~~ circuitry on circuit board 68 converts the signals received from optical modules 12 over the connectors 24 to a common signaling rate. This configuration allows multiple optical modules 12 to share a common set of circuitry that may include some or all of the following: a power regulator 72, an electro-optics micro controller [[88]], a ~~TCS~~ Timing Control System (TCS) daughter card [[82]] configured to synchronize and control timing and provide a clock generator for the system, and a back plane repeater [[74]] to boost signal strength as the signal degrades due to the length the signal travels on the board. The circuit board also includes ASICS configured to allow the optical modules 12 to be "hot pluggable." This allows an operator to add, remove, or swap optical devices while the system is in use without disrupting the operation of the other modules 12 on carrier pack 14.

Referring to FIG. 5, a stack interconnect arrangement 100 in carrier pack 14 allows a column of optical modules 12 to be connected to circuit board 68. A first optical module 122 plugs into an upper connector 117 and a second optical module 126 plugs into a lower connector 119. The spacing between the connectors 117 and 119 allows the two optical modules to fit into a limited space such that a second carrier pack may be plugged into a slot above the current carrier pack. In this case, the bottom 120 of the second carrier pack would lie directly above the top optical module as shown. The stack interconnect arrangement 100 provides spacing between the modules.

In the top slot in stack interconnect arrangement 100, a connector 118 on module 122 mates with connector 117 on a riser circuit board 104. The module 122 includes a printed circuit board 124. When connected, a communication path exists between the printed circuit board 124 and the riser circuit board 104.

A set of connectors, e.g., so-called mezzanine connectors 106 and 108 connect the main circuit board 68 to a riser printed circuit board 104. A mezzanine connector is a connector including an array of pins in rows and columns used to pass multiple signals through a small area. Mezzanine connectors have a male and female portion which mate and un-mate with application of force pushing the pins of the male connector into the receptacles of the female connectors. The mezzanine connectors allow high-speed differential pair signals traversing the connector to maintain the signal integrity. Thus, a communication path exists between optical module 122 and main board 68. In one arrangement, to provide the communication path using the mezzanine connectors, a first male mezzanine connector 108 attaches to the topside of the circuit board 68 and a female mezzanine connector 106 connects to the riser board 104. The mezzanine connectors separate the riser printed circuit board from the main board 68. When the male mezzanine connector 108 is connected to the female mezzanine connector 106, a communication path forms between the main circuit board and the riser board 104. Thus, when module 122 is plugged into connector 117 a communication path exists between the module 122 and the main board 68. The mezzanine connectors 106 and 108 can be separated allowing removal of riser board 104 from the main circuit board 68. The removal of a single riser board may be advantageous in the event of a board failure. For example, if a riser board fails within the pack the riser board is removed and replaced without necessitating the replacement of the main circuit board. On the other hand, if circuitry on the main circuit board fails, the main circuit board can be replaced with a new circuit board and the riser boards can be removed from the failed main circuit board and attached to the new main circuit board. In order to remove riser board 104 from main circuit board 68, the user disassembles carrier pack 14 (i.e. removes end caps ~~68~~ 36 and heat sink region 22) and applies a force to separate the male portion 108 of the mezzanine connector from the female portion of the mezzanine connector 106.

Similarly, to provide the bottom connection, a second male connector 110 attaches to the bottom side of the main board 68. Male connector 110 connects to female connector 112 that attaches to riser board 114.

Mezzanine connectors 106, 108, 110, and 112 may include a plastic body with metal contacts. In one example, the mezzanine connector attaches to the printed circuit board using ball grid array (BGA) or compliant pins with post soldering. In a BGA mount, the package includes bond wires connected to a laminate and the laminate connects to the bond wires (e.g. small solder balls) underneath the package. The customer solders the bond wires directly to the board, thus reducing a floor space on the board. However, alternate connection methods are feasible.

In another example, the mezzanine connector attaches to the printed circuit board (PCB) using a flexible ~~pcb~~ PCB connection in which a board edge host connector is on the main board. A flexible ~~pcb~~ PCB plugs into the connector that is rigid at either end with gold finger contacts. The finger contacts mate to the host connector on main card end and directly into the optical module on the other end. The opposite end is tied to the carrier housing to prevent movement while the optical module is inserted.

The attachment of the male and female connectors could be reversed such that the female connector attaches to the main board and the male connector attaches to the riser printed circuit board. A second ~~optical receiver~~ carrier pack ~~12~~ 14 could be plugged ~~in to~~ into a second I/O slot directly above the first I/O slot 28 in the back plane 11 of the shelf 16. In this case, the bottom 120 of the second ~~receiver~~ carrier pack 14 would lie directly above the top optical module 122 as shown in Figure 5.

Referring to FIG 6, the stack device 100 may alternately include a female connector attached to riser board 104,114 that is adapted to receiver a male connector on the optical module 122,126 ~~the connectors 117 and 119 attached to a set of second riser circuit boards 142 and 146 respectively~~. Connection devices 140 and 144 connect the ~~second riser circuit boards 142 and 146~~ optical modules 122,126 to the top and bottom riser circuit boards 104 and 114. The connections between the modules 122 and 126, riser boards, and main circuit board 68 are ~~similar~~ reversed in polarity (male/female connections) to those discussed concerning FIG. 5.

In another example, the male and female set of mezzanine connectors is replaced with a single non-separable connector. A first end of the non-separable connector connects to the main circuit board while a second end of the connector connects to the riser board forming a communication path between the riser board to the main circuit board.

Referring to FIG. 7 and FIG. 8, the ~~optical~~ carrier pack 14 is configured to handle 80 Gigabit per second of traffic or greater. In this example, as before the carrier pack ~~12~~ 14 is multi-service pluggable and may accept small form pluggable (SFP) and 10 Gigabit small form pluggable (XFP) devices operating at various signaling rates. In this example, reducing the extent of heat sink region 22 reduces the overall length of carrier pack 14. To account for the reduced heat dissipation, a second set of heat sinking devices 156 may replace one or both of the topside panels 38. The circuit board 68 (FIG. 8) includes a reduced number of ASICS that perform the needed functionality or some of the functionality may be transferred to the optical devices.

In the preceding examples, the optical modules 12 may include but are not limited to one or more of the following carrier speeds: 8x OC3/ 12 SFP, 8x OC 48 SFP, 8x GbE SFP, 2x 10G XFP, and 2x 10GE XFP. Optical Carrier transmission speeds, used in fiber optic networks conform to SONET standard where OC-1 is 51.85 Mbps. Higher levels are multiples of that speed.

A number of embodiments of the invention have been described. Nevertheless, it will be understood that various modifications may be made without departing from the spirit and scope of the invention. Accordingly, other embodiments are within the scope of the following claims.

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A ~~optics~~ carrier pack comprising

a housing unit having multiple slots configured to accept optical modules;

a stack interconnect having a connector associated with a slot of the multiple slots of the housing unit[[,]];

~~an optics~~ a carrier pack connector electrically coupled to the connector of the stack interconnect.

2. (Currently amended) The carrier pack of claim 1, further comprising:

a main circuit board to supply an electrical path to couple the ~~optics~~ carrier pack connector to the connector of the stack interconnect.

3. (Currently amended) The carrier pack of claim 1, further comprising:

a main circuit board to supply an electrical path to couple the ~~optics~~ carrier pack connector to the connector of the stack interconnect and configured to convert a first signaling rate associated with an optical module that is inserted into the slot to a second signaling rate associated with a device coupled to the ~~optics~~ carrier pack connector.

4. (Currently amended) The carrier pack of claim 3 wherein ~~the~~ multiple optical modules, each optical module associated with one of the multiple slots of the carrier pack, share a common set of circuitry ~~in~~ on the ~~circuit module~~ main circuit board.

5. (Currently amended) The carrier pack of claim 1 wherein the stack interconnect is connected to ~~the~~ a main circuit board.

6. (Currently amended) The carrier pack of claim 1 wherein the stack interconnect includes a riser board and a mezzanine connector.

7. (Currently amended) The carrier pack of claim 2 wherein the stack interconnect includes a

riser board and a mezzanine connector to electrically couple the connector and the main circuit board.

8. (Currently amended) The carrier pack of claim 6 wherein the mezzanine connector includes a male portion and a female portion.

9. (Currently amended) The carrier pack of claim 7 wherein the mezzanine connector includes a male portion and a female portion, the male portion of the mezzanine connector attaching to the main circuit board and the female portion of the mezzanine connector attaching to the riser board.

10. (Currently amended) The carrier pack of claim 8 wherein the riser board is removably coupled to a main circuit board.

11. (Currently amended) The carrier pack of claim 7 wherein a female portion of the mezzanine connector attaches to the main circuit board and a male portion of the mezzanine connector attaches to the riser board such that the riser board is removably coupled to the main circuit board.

12. (Currently amended) The carrier pack of claim 7, further comprising a second riser board and a second mezzanine connector wherein the ~~first~~ mezzanine connector attaches [[a]] the ~~first~~ riser board to a top side of the main circuit board and the second mezzanine connector attaches [[a]] the second riser board to a bottom side of the main circuit board.

13. (Currently amended) The carrier pack of claim 7 wherein the mezzanine connectors include a plastic body and metal contacts.

14. (Cancelled)

15. (Currently amended) The carrier pack of claim 2 wherein the stack interconnect ~~device~~ includes a connection to ~~the circuit module~~ a common set of circuitry on the main circuit board.

16. (Currently amended) The carrier pack of claim 1, further comprising

two faceplates separated from each other by a slot in the housing.

17. (Currently amended) The carrier pack of claim 1, further comprising

a heat sink.

18. (Currently amended) The carrier pack of claim [[15]] 17 wherein an upper part of the housing includes the heat sink.

19. (Cancelled)

20. (Currently amended) The carrier pack of claim 1, further comprising

status indicators associated with operation of the module or a slot of the multiple slots of the housing unit.

21. (Currently amended) The carrier pack of claim 20, wherein a faceplate includes the status indicators.

22. (New) An optics pack comprising:

a carrier pack comprising

a housing unit having multiple slots adapted to receive optical modules;

a stack interconnect having a connector associated with a slot of the multiple slots of the housing unit;

a carrier pack connector electrically coupled to the connector of the stack interconnect; and

a plurality of optical modules each comprising a connector adapted to electrically couple the optical module with the connector of the stack interconnect of the carrier pack.

23. (New) An optics pack according to claim 22 configured to convert a first signaling rate associated with an optical module that is inserted into a slot of the multiple slots of the housing unit to a second signaling rate associated with a device coupled to the carrier pack connector.

24. (New) A system comprising:

at least one carrier pack comprising

a housing unit having multiple slots adapted to accept optical modules;

a stack interconnect having a connector associated with a slot of the multiple slots of the housing unit;

a carrier pack connector electrically coupled to the connector of the stack interconnect;

a plurality of optical modules, each optical module comprising a connector adapted to electrically couple the optical module with the connector of the stack interconnect of the at least one carrier pack; and

a switch self adapted for receiving the at least one carrier pack, the switch shelf comprising a back plane adapted to couple the switch shelf with the carrier pack connector of the at least one carrier pack.

Amendments to the Drawings:

Please replace all of the drawing sheets currently on file with enclosed replacement sheets 1 to 7 containing Figures 1 to 8.

Because of the extensive nature of the changes, the filing of marked up figures showing the changes is not possible

Figures 1-8 have been amended.

With respect to Figure 1, the back plane is properly labelled with new identifier 11 and the switch shelf is now labelled with identifier 16. An additional existing topside panel 38 is identified for clarity. A second part of the split faceplate 20 that was in the original version of Figure 1 is also identified for clarity. Slot 30 is relabelled to more clearly identify the area of the slot. More than a single screw is labelled to more clearly identify "the set of screws" 40. Numerical identifier 17 has been removed from the figure, as it does not clearly identify all the features that combine to form the housing.

With respect to Figure 2, an edge view of an optics module 12 has been added to the drawings with the optical module connector 18 and a pluggable optical component 151 identified. The previous Figure 2 has been cancelled.

With respect to Figure 3, a top view of an optics module 12 has been added to the drawings with the optical module connector 18, pluggable optical components 151, and feature 31 identified. The previous Figure 3 has been cancelled.

With respect to Figure 4, the former Figure 4 has been replaced with an alternative representation of the same view of the carrier pack 14. Endcap 36 is labelled for clarity. Guide rails 29 are labelled for clarity. Carrier pack connector 26 is labelled for clarity. More than a single screw is labelled to more clearly identify "the set of screws" 40. A second part of the split faceplate 20 is identified for clarity. Connector device 76 is shown in a breakaway view and components 112 and 114 of the bottom connector are identified and components 104, 108 and 140 of the top connector are identified. Identifiers 70, 74, 78, 82, 84 and 86 have been deleted.

With respect to Figure 5 and 6, the male and female portions of the mezzanine connectors have been added to the drawings. In addition, in Figure 6 numerical identifiers 117, 118 and 119 have been deleted from the figure as they do not in fact exist in the embodiment as properly described. In Figure 5, 118 is the female connector on the optical module 122 and 117 and 119 are the male connectors in the carrier rack for the coupling connection. In Figure 6, 140 and 144 are the female connectors in the carrier rack and 142 and 146 are the male connectors as a part of the optical modules for the coupling connection.

With respect to Figure 7, feature 31 of optical module 12 has been identified for clarity. Pluggable optic device 151 has been relabelled for clarity. A second portion of the split faceplate 20 has also been identified for clarity.

With respect to Figure 8, carrier pack connector 26 has been labelled for clarity. Printed circuit board 68 has been labelled for clarity. Both portions of the split faceplate 20 have been identified for clarity. Identifiers 80 and 86 have been deleted.

It is submitted that none of the above-described changes introduce new matter into the application. The amendments are for clarity and to ensure that the limitations of the claims are shown in the figures.

Attachment: Replacement Sheets

REMARKS/ARGUMENTS

Amendments to the Specification

The Summary has been amended for consistency with amendments made to the description and claims.

The letter "T" has been deleted on page 2, line 7 of the specification in response to the Examiner's identification of this clerical error as noted on page 2 of the Office Action.

The Brief Description of the Drawings section has been amended to properly identify the drawings subsequent to amendments made to the figures. In particular, Figure 1 has been identified as including a carrier pack, a shelf and optical modules. Also, Figures 2 and 3 have been identified as being side and top views, respectively of an optical module.

The Detailed Description section has been amended to clarify aspects that were improperly labelled or identified. Amendments made to the Detailed Description include the "optical back plane" being labelled with new identifier 11 and the numerical identifier 16 being associated with the "switch shelf" on page 3, line 18. "Face place 20" on page 3, line 25 has been replaced with "split face plate 20" to clarify that the face plate is comprised of two portions, both of which were originally shown in Figure 1, but only one of which was specifically identified. The inconsistent language associated with numerical identifier 32 ("connectors" on page 3, line 26, "mating features" on page 3, line 28, and "connector slots" on page 4, line 31) has been replaced with "connector access holes" which were shown in original Figure 1 and are easily identifiable in amended Figure 4.

Another amendment to the Detailed Description is the description of Figure 6. The description was amended to describe the manner of connection between the optical modules and the carrier pack. The description has been amended to reflect the concept of a female connector on the carrier pack and a male connector on the optical module that was shown in original Figure 6. Figure 6 has been amended as described above for consistency with this description.

These represent a few examples of amendments made to the specification. It is submitted that no new matter has been added to the specification. The amendments are intended to clarify existing features found in the original specification and drawings, and to provide consistency of terminology used in the description of the features.

Amendments to Drawings

Figures 1 to 8 have been amended.

With regard to the Examiner's statement on page 3 of the Office Action that the drawings do not clearly shown the limitations of claims 1 and 2, it is submitted that the limitations of claims 1 and 2 are now clearly shown in the replacement drawings. Amended claim 1 recites "a carrier pack (14) comprising a housing unit (17) having multiple slots (30) configured to accept optical modules (12); a stack interconnect (104, 106, 108), having a connector (117, 119, 140, 144) associated with a slot (30) of the multiple slots (30) of the housing unit (17); a carrier pack connector (26) electrically coupled to the connector (117, 119, 140, 144) of the stack interconnect (104, 106, 108)".

Claim 2 recites "the carrier pack of claim 1, further comprising: a main circuit board (68) to supply an electrical path to couple the carrier pack connector (26) to the connector (117, 119, 140, 144) of the stack interconnect (104, 106, 108)".

The numerical identifiers have been added to the claim language to show that all the features of the claims can be found in the drawings.

The male and female portions of the mezzanine connectors as recited in claims 8, 9 and 11 have been added to the Figures 5 and 6 in response to the Examiner's identification on page 3 of the Office Action of these features not being shown in the drawings.

Status of Claims

Claims 14 and 19 have been cancelled from the application.

Claims 1-13, 15-18, 20 and 21 remain in the application.

New claims 22, 23 and 24 have been added to the application. New claim 22 recites an optics pack comprising a carrier pack and a plurality of optical modules adapted to be received by the carrier pack. New claim 23 is dependent on claim 22 and recites similar subject matter to claim 3. New claim 24 recites a system comprising at least one carrier pack, a plurality of optical modules adapted to be received by the at least one carrier pack, and a shelf adapted to receive the at least one carrier pack.

The subject matter of new claims 22 and 24 is found in the specification, in particular at page 3, lines 17-18, as well as in Figure 1. The subject matter of claim 23 is found on page 5 at lines 3-7.

Amendments to Claims

Claim 1 has been amended to replace the term "optics pack" with "carrier pack" to more accurately reflect the invention as described in the description. The amendment is not intended as an additional limitation to the claim, but is made for the sake of clarity. Similarly, in subsequent claims the term "optics pack" has been replaced with "carrier pack".

The remaining claims have been amended by adding the word "carrier" to the preamble prior to the word "pack".

In the claims the expressions "circuit board" and "main board" have been amended for consistency to be "main circuit board".

Claim 3 has been amended by replacing "a circuit board" with "a main circuit board".

Claim 4 has been amended for clarity.

Claim 12 has been amended for consistency with terms introduced in claim 7.

Claim 15 has been amended by replacing the expression "the circuit module" with "a common set of circuitry on the main circuit board".

Oath/Declaration

A new declaration is submitted herewith that properly identifies the specification to which the declaration is directed.

35 U.S.C 102 Claim Rejections

The Examiner has rejected claims 1-13 and 15-20 under 35 U.S.C. 102(e) as being anticipated by Hayashi (U.S. Patent No. 6,545,611).

The Examiner alleges that Hayashi discloses all the features of claim 1. In particular, a housing unit having multiple slots configured to accept optical modules is disclosed in Hayashi at column 4, lines 61-64. A stack interconnect having a connector associated with a slot of the multiple slots of the housing unit is disclosed in Hayashi by connector C2a in Figure 2. An optics pack connector electrically coupled to the connector of the stack interconnect is disclosed by connector C2b in Figure 2.

Claim 1 in its original form recites an optics pack having multiple slots configured to accept optical modules. In amended claim 1 "the optics pack" has been replaced with "the carrier pack". As described in the description on page 3 at lines 17-20, "carrier pack 14 having slots 30 to accept optical modules12. Multiple ones of the optical modules 12 may be connected to the carrier pack 14". The carrier pack 14 is adapted to be included in a switch shelf. The switch shelf is adapted to receive a plurality of such carrier packs. As shown in Figure 1, the carrier pack has four individual slots, three of which are shown to already contain optical modules and one of which that is currently available to receive optical module 12.

Hayashi discloses a subrack 3 comprising eleven slots, whereby some of the slots are adapted to receive up to two separate transmission units (PIU units). In column 4, lines 52-54 Hayashi discloses that the PIU units "are composed of a sub-printed circuit board 10 and a main printed circuit board 20". The main printed circuit board 20 is used to house the sub-printed circuit board 10 and connects with a BWB mounted on the subrack 3. The only realistic comparison that could be made between Hayashi and the present application is that main printed circuit board 20 could be compared to the carrier pack recited in claim 1. However, the main printed circuit board 20 disclosed by Hayashi does not include "multiple slots configured to accept optical modules". Each main printed circuit board 20 contains a single slot that receives a single sub-printed circuit board 10.

In the interest of providing a proper comparison between the features recited in claim 1 and what the Examiner states can be found in Hayashi, it should be noted that the Examiner has inaccurately compared features disclosed by Hayashi with those recited in the present application. In claim 1, The Examiner compares the connector associated with a slot of the multiple slots of the housing unit with connector C2a as disclosed by Hayashi. A more appropriate comparison would be connector C3a as disclosed by Hayashi. Similarly, a carrier pack connector electrically coupled to a connector of a stack interconnect as recited in claim 1 and compared by the Examiner to connector C2b as disclosed by Hayashi, would more appropriately be compared to connector C3a as disclosed by Hayashi.

It is submitted that since Hayashi does not disclose all the features of a carrier pack that has "multiple slots configured to accept optical modules", Hayashi cannot anticipate all the features recited in claim 1. Therefore, it is respectfully requested that the Examiner reconsider and withdraw the anticipation rejection of claim 1.

Claims 2-13, 15-18 and 20 are dependent on claim 1 or intervening claims dependent on claim 1. As these claims depend from a claim that should be allowable, these claims should also be allowable.

In addition, it is alleged in the Office Action that claim 3 is anticipated by Hayashi. Applicant submits that Hayashi does not disclose "a main circuit board to supply an electrical path to couple the carrier pack connector to the connector of the stack interconnect and configured to convert a first signaling rate associated with an optical module that is inserted into the slot to a second signaling rate associated with a device coupled to the carrier pack connector". The Examiner has not indicated where this feature is disclosed in the Hayashi reference and as the Applicant contends it is not disclosed in Hayashi it is respectfully requested that for at least the reasons described above, the objection to claim 3 should be withdrawn.

With regard to claims 17 and 18, the Examiner has not indicated where the feature of a heat sink is disclosed in the Hayashi reference. The Applicant contends that a heat sink is not disclosed in Hayashi and it is respectfully requested that for at least the reasons described above the objection to claims 17 and 18 should be withdrawn.

35 U.S.C 102 Claim Rejections

The Examiner has rejected claims 14 and 21 under 35 U.S.C. 103(a) as being unpatentable over Hayashi.

Claim 14 has been cancelled, therefore the Examiner's objection is moot.

With regard to claim 21, the claim is dependent on claim 20 and claim 20 is dependent on claim 1. As all the features of claim 1 are not disclosed by Hayashi, and as the Examiner is relying on all of the features that are recited in claim 1 to be taught by Hayashi in the obviousness rejection of claim 21, it is submitted that the Examiner has not satisfied at least one of the three criteria for establishing a prima facie case of obviousness, namely that all of the features be disclosed by the cited references. The Examiner further alleges that it would have been obvious at the time of the invention for Hayashi to have status indicators on a faceplate, even though there is no suggestion or disclosure of desiring or using such indicators in Hayashi. For at least the above reasons, it is submitted that claim 21 patentably distinguishes over Hayashi and it is respectfully requested that the Examiner reconsider and withdraw the objection to claim 21.

In view of the foregoing, early favorable consideration of this application is earnestly solicited.

Respectfully submitted,

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By ____________________
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Docket No.
71493-1310 /aba

OIPE JC13
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PATENT & TRADEMARK

Declaration For Patent Application

English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

OPTICS PACK

the specification of which

(check one)

☐ is attached hereto.

☒ was filed on October 6, 2003 as United States Application No. or PCT International Application Number 10/680,328

and was amended on ______________________ (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior applications and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT International application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)			Priority Not Claimed
(Number)	(Country)	(Day/Month/Year Filed)	☐
(Number)	(Country)	(Day/Month/Year Filed)	☐
(Number)	(Country)	(Day/Month/Year Filed)	☐

I hereby claim the benefit under 35 U.S.C. Section 119(e) of any United States provisional application(s) listed below:

(Application Serial No.)	(Filing Date)
(Application Serial No.)	(Filing Date)
(Application Serial No.)	(Filing Date)

I hereby claim the benefit under 35 U. S. C. Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. Section 112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, CFR Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)
(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)
(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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